How can we develop the ability of children from under-resourced backgrounds to convince and prove orally, ensuring sustained impact, through developing teacher knowledge?

Research and Innovation Workgroup:
NCP22B/C Oracy

MATHSHUBS ORIGIN

What we've noticed

- When oracy is implemented in a classroom, children's reasoning improves.
- Proof is for all children of all abilities.
- I have used sentences stems for most questions.
- I have higher expectations of mathematical explanations from children.
- Pupils are beginning to challenge one-another's explanations.
- There are so many levels of reasoning and children need to nurtured to move through the steps.

Why we think this is significant

- The oracy skills practised and learnt in maths are transferable into all areas of the curriculum.
- All children can be supported by the scaffolds implemented and then expand upon them through skilled pedagogy.
- Using the reasoning scale, children can move forward through the scale and become confident mathematicians with a positive mindset about their abilities.

Next steps

- Share the reasoning scale
- CPD for staff on oracy in maths
- Develop pedagogy in the school.
- Introduce systems and devices to improve oracy in maths throughout the school.

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What we've noticed

Increased expectations that 'finding proof' is for all children. Children may need additional scaffolding and modelling but the children's confidence and responding orally has increased.

Due to raised expectations, use of stem sentences, modelling and use of precise mathematical knowledge, pupils have been empowered to demonstrate their knowledge verbally.

The reasoning scale allows the identification of starting points and next steps in children's learning. Opportunities need to be planned regularly for 'proof.'

Teacher's pedagogical knowledge needs to be secure to plan these opportunities, that are now part of the maths scheme used. Teachers need to be confident to provide these opportunities.

Why we think this is significant

- By not putting ceilings on children's mathematically ability, ALL children have the opportunity to convince and prove orally.
- Carefully planned opportunities mean that children develop the mathematically reasoning skills needed in the future. These skills are transferrable.
- The ability to use stem sentences and precise mathematical vocabulary provides children with the 'tools,' needed to reason mathematically.
- The reasoning scale provides a clear structure for planning and helps to develop teacher pedagogy, where we may have become reliant previously on a written scheme.

Next steps

- Deliver CPD for staff and allow collaborative planning opportunities to share expertise and facilitate discussions around opportunities for children to demonstrate 'proof,' when reasoning mathematically.
- Share the reasoning scales.
- Ensure opportunities for finding 'proof' are regularly timetables.
- Continue to embed stem sentences and the precise use of mathematical vocabulary as part of our 'oracy' key school driver work.
- Use of pre-teach for those who may require further support.

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What we've noticed

- All students no matter their ability can develop their thinking around convincing and proving.
- Despite having different starting points and levels of vocabulary a clear and structured approach has moved them forwards.
- Children are demonstrating the use of mathematical language and full sentences in their explanations.
- As they have learned more vocabulary, the more curious they have become about words and their definitions.
- Time isn't always given for opportunities to develop this skill.
- Children are beginning to use models and diagrams to show understanding.
- Content knowledge and language needs to be strong and secure for successful reasoning to take place.

Why we think this is

- There is a clear framework and structure for children to progress. Next steps are clear and modelling of processes support development.
- High expectations and modelling of language have broadened mathematical understanding.
- Students feel accomplished when able to use mathematical terms, become more expert at using them and curious about what new terms for concepts are and what they mean.
- High expectations for answering using sentences and examples are essential. This becomes then becomes second nature and a regular part of maths lessons.
- Proof as part of reasoning isn't always seen valuable by all, so it is given less time. An essential skill and time needs to be given to it.
- Deeper knowledge of content frees the student from cognitive load, hence allowing the use of prior knowledge and discussion to support the skill.

Next steps

- A consistent approach to vocabulary must be developed across the school.
- Opportunities to develop and use mathematical language and higher order reasoning skills need to be planned for.
- Sharing reasoning scale and strategies across the school.

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What we've noticed

- My own teaching has changed. I have modelled in more depth how to explain and how to articulate mathematical thinking and this has improved the responses given by the class.
- The use of sentence stem, convince yourself, convince a friend and the use of open ended tasks and precise mathematical vocabulary has greatly improved the confidence and quality of discussion from the children.
- That our scheme of work needs to allow for depth of reasoning tasks

Why we think this is significant

- Consistency in approach to teaching/learning with clear progression in reasoning skills identified.(describing, explaining, convincing, justifying and proving)
- ensure that all children see problem-solving often involving taking wrong turns and making mistakes: every learner has the right to struggle and the right to enjoy success and that there are different solutions to one problem. (pupil voice feedback)

Next steps

- A new revised long term plan using white rose but with a half termly integrated NRICH reasoning challenge –
- use of sentence stems being embedded across the school
- Ck to lead CPD and staff training for use of the reasoning scale, NRICH and NCETM resources
- Teachers to plan, implement and reflect on reasoning task and to share findings in staff INSET - how are we progressing as a school on the reasoning scales?